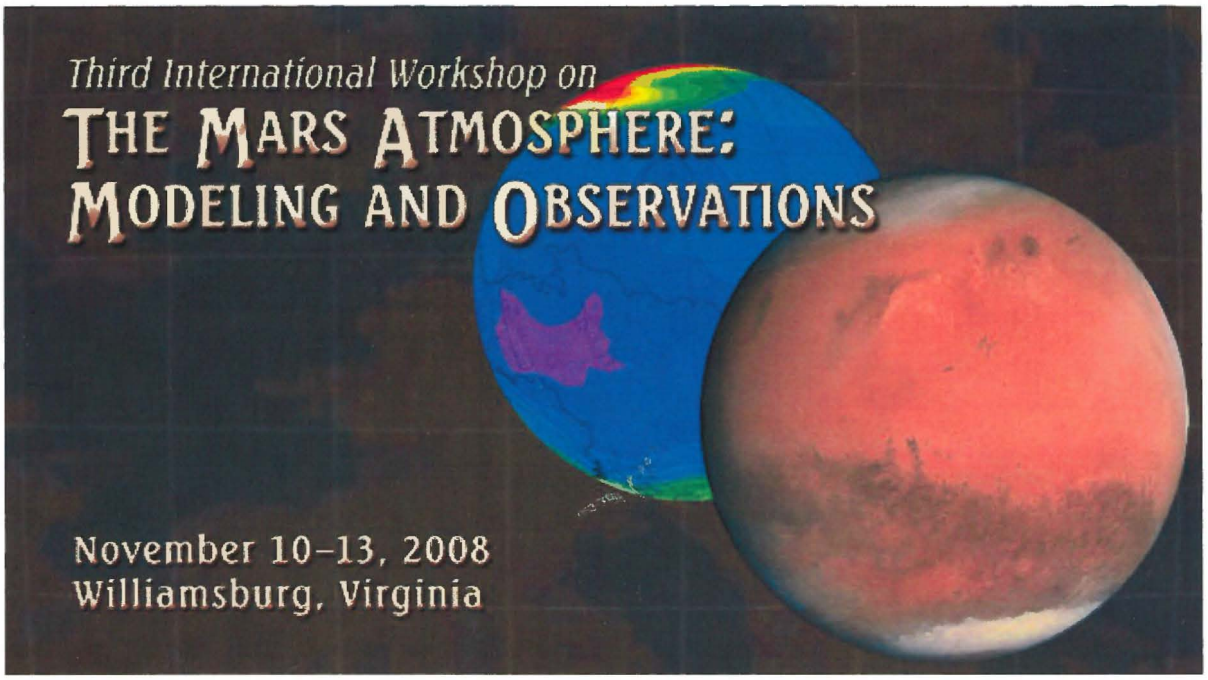

Program

LUNAR AND PLANETARY INSTITUTE

Program for Technical Sessions

Third International Workshop on

THE MARS ATMOSPHERE: MODELING AND OBSERVATIONS

November 10–13, 2008

Williamsburg, Virginia

Sponsored By

Lunar and Planetary Institute
NASA Mars Exploration Program
Centre National d'Etudes Spatiales (CNES)
NASA Mars Program Office

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Francois Forget, *Laboratoire de Meteorologie Dynamique, France*
Joel S. Levine, *NASA Langley Research Center, United States*

Workshop Scientific Committee

Francois Forget, *Laboratoire de Meteorologie Dynamique, France*
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Olivier Witasse, *European Space Technology Centre, The Netherlands*
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Student Travel Grants
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Naomi Goldenson
Mesa Community College

Malynda Chizek
New Mexico State University

Angela Zalucha
Massachusetts Institute of Technology

Seth Kadish
Brown University

Tamara McDunn
University of Michigan

Guide to Sessions

Third International Workshop on

THE MARS ATMOSPHERE: MODELING AND OBSERVATIONS

November 10–13, 2008 • Williamsburg, Virginia

Monday, November 10, 2008

8:30 a.m.	Dogwood Room	Mars Atmosphere General Circulation and Climate: Observations
11:00 a.m.	Dogwood Room	Mars General Circulation and Climate: Models
2:00 p.m.	Dogwood Room	Mars General Circulation and Climate: Models (continued)
4:00 p.m.	Dogwood Room	Mars Upper Atmosphere
5:30 p.m.	Cascade Room	Poster Session

Tuesday, November 11, 2008

9:00 a.m.	Dogwood Room	Mesoscale and Microscale: News from Phoenix, MER, and Modeling
11:40 a.m.	Dogwood Room	Water, Clouds, and Dust: Water Vapor
2:00 p.m.	Dogwood Room	Water, Clouds, and Dust: Water Vapor (continued)
2:48 p.m.	Dogwood Room	Water, Clouds, and Dust: Dust and Cloud Observations

Wednesday, November 12, 2008

9:00 a.m.	Dogwood Room	Water, Clouds, and Dust: Understanding the Dust Cycle
11:00 a.m.	Dogwood Room	Water, Clouds, and Dust: Understanding Clouds
11:50 a.m.	Dogwood Room	Mars Seasonal Polar Caps: CO_2 Ice and H_2O Frost
2:00 p.m.	Dogwood Room	Mars Seasonal Polar Caps: CO_2 Ice and H_2O Frost (continued)
4:00 p.m.	Dogwood Room	Trace Species and Photochemistry

Thursday, November 13, 2008

9:00 a.m.	Dogwood Room	Trace Species and Photochemistry (continued)
11:10 a.m.	Dogwood Room	Atmospheric Sciences to Understand the Past of Mars
2:00 p.m.	Dogwood Room	Reference Atmospheres, Database and Entry, Descent, Landing Issues
4:00 p.m.	Dogwood Room	Future Observations
6:00 p.m.		Meeting Adjourned

Monday, November 10, 2008
MARS ATMOSPHERE GENERAL CIRCULATION AND CLIMATE: OBSERVATIONS
8:30 – 10:30 a.m.

Chair: F. Forget

Levine J. S. Forget F.
Opening Remarks

McCleese D. J. * Schofield J. T. Aharonson O. Abdu W. A. Bandfield J. L. Banfield D. Calcutt S. B. Heavens N. G. Irwin P. G. J. Kass D. M. Kleinboehl A. Lawson W. G. Leovy C. B. Lewis S. R. Paige D. A. Read P. L. Richardson M. I. Taylor F. W. Teanby N. Zurek R. W. **(Invited, 20 minutes)**
Observations of the Martian Atmosphere with the Mars Climate Sounder **[#9037]**
This paper describes the Mars Climate Sounder (MCS) investigation and introduces observations acquired in one full year of operation. MCS continues to acquire high vertical resolution profiles of temperature, dust, condensates of CO_2 and H_2O, and water vapor.

Kleinböhl A. * Schofield J. T. Kass D. M. Abdou W. A. McCleese D. J.
One Mars Year of Atmospheric Temperature, Dust, and Water Ice Profiles Retrieved from Mars Climate Sounder Measurements **[#9086]**
We present profiles of temperature, dust opacity, and water ice opacity retrieved from Mars Climate Sounder measurements covering one Mars year.

Kass D. M. * Kleinböhl A. Schofield J. T. McCleese D. J. Mischna M. A. MCS Team
MCS Views of the Northern Polar Atmosphere During Phoenix Approach **[#9072]**
MCS observed the northern polar atmosphere during late northern spring to assist in the Phoenix landing. This work concentrates on the temperature structure and maps of dust opacity. These show a number of interesting features related to the regional circulation.

Hinson D. * Wang H.
Baroclinic Eddies and Dust Storms During Autumn of MY 27 **[#9019]**
We are using a combination of radio occultation data and wide-angle images obtained with Mars Global Surveyor in MY 27 to investigate martian meteorology, including baroclinic eddies and frontal/flushing dust storms.

Giuranna M. * Formisano V. Montabone L. Rinaldi G.
Observations of the Mars Polar Vortex with the Mars Express Planetary Fourier Spectrometer **[#9128]**
The Mars Express (MEX) Planetary Fourier Spectrometer (PFS) data set provides several martian years of consistently sampled, vertically resolved temperature measurements, we take a detailed look at the different aspects and behaviours exhibited by the Mars polar vortex.

Hayward R. K. * Fenton L. K. Tanaka K. L. Titus T. N. Colaprete A. Christensen P. R.
Aeolian Features as Ground Truth for Atmospheric Modeling on Mars **[#9033]**
Dunes provide a global-scale record of surface/atmosphere interaction. We consider four dune characteristics as possible records of "ground truth" and compare them to General Circulation Model (GCM) output.

Sonnabend G. * Sornig M. Kroetz P. J. Stupar D. Montabone L. Fast K. Schieder R.
Mars Mesospheric Winds Around Northern Spring Equinox from High Resolution Infrared Spectroscopy **[#9055]**
We present observations of mesospheric winds on Mars around northern Spring Equinox. Observations were carried out during three seasons (Ls=335, 357, 040) using the Cologne Tuneable Heterodyne Infrared Spectrometer.

Sornig M. Sonnabend G. Kroetz P. J. Stupar D. Schieder R. **(1-minute poster summary)**
Potential of High Resolution Mid-Infrared Heterodyne Spectroscopy to Study the Martian Atmosphere **[#9050]**
Infrared heterodyne spectroscopy at spectral resolutions of $> 10^5$ allows retrieval of many physical parameters from fully resolved individual lines. The Cologne THIS and its specific application to the atmosphere of Mars will be presented.

Banfield D. Kleinbohl A. Schofield J. T. Kass D. M. McCleese D. J.
MCS Team **(1-minute poster summary)**
Traveling and Forced Waves from MRO MCS **[#9063]**
We are characterizing the seasonal behavior of the forced and traveling waves in the martian atmosphere as seen from MRO MCS. This work is very complementary to previous work with MGS TES nadir temperature retrievals.

Mischna M. A. Kass D. M. Friedson A. J. Schofield J. T. Kleinböhl A. Zurek R. W. Tamppari L. K.
Formisano V. PFS Team MCS Team **(1-minute poster summary)**
An Intercomparison of PFS and MCS Temperature Profiles in Support of Mars Phoenix EDL **[#9091]**
Both the MCS and PFS-LW instruments were used for characterizing the martian atmosphere over the Phoenix landing site in April/May 2008. We present results from that study, highlighting attempts to resolve differences in profiles obtained from each instrument.

10:30 – 11:00 a.m. BREAK

Monday, November 10, 2008
MARS GENERAL CIRCULATION AND CLIMATE: MODELS
11:00 a.m. – 12:30 p.m.

Chair: S. Bougher

Haberle R. M. * Wilson R. J. Hollingsworth J. L. Kahre M. A. **(Invited, 20 minutes)**
Status of the NASA/NOAA Mars General Circulation Model **[#9113]**
We will discuss the current status of the NASA/NOAA Mars General Circulation Model.

Forget F. * Millour E. Gonzalez-Galindo F. Lebonnois S. Madeleine J.-B. Meslin P.-Y. Montabone L. Spiga A. Hourdin F. Lefevre F. Montmessin F. Lewis S. R. Read P. Lopez-Valverde M. A. Gilli G.
Modeling the Martian Atmosphere with the LMD Global Climate Model **[#9054]**
The Global Climate Model developed at LMD (Paris) in collaboration with IAA (Spain), AOPP and the OU (UK) has been improved. It is used for many applications (water, dust, CO_2, radon cycles, photochemistry, thermosphere, ionosphere, etc.).

Takahashi Y. O. * Hayashi Y.-Y. Odaka M. Ohfuchi W.
High Resolution Simulations of the General Circulation of the Martian Atmosphere: Small and Medium Scale Disturbances and Dust Lifting Processes **[#9082]**
The high resolution simulations of the martian atmosphere are performed by using a Mars general circulation model to obtain some insights into the features of small and medium scale atmospheric disturbances and its effects on dust lifting process.

Akingunola A. * McConnell J. C. Kaminski J. Farahnaz F. R. Wu D.
The Second Generation of the Global Mars Multiscale Model **[#9090]**
We present the second generation of the Global Mars Multiscale Model (GM3v2).

Mischna M. A. Wilson R. J. * **(Invited, 20 minutes)**
The Mars General Circulation Model Intercomparison Study **[#9088]**
We revisit the Mars GCM intercomparison study begun in 2007, and introduce new results provided from additional teams. At present, the intercomparison consists of 10 distinct model architectures from six modeling teams.

12:30 – 2:00 p.m. LUNCH

Monday, November 10, 2008
MARS GENERAL CIRCULATION AND CLIMATE: MODELS (continued)
2:00 –3:30 p.m.

Chair: L. Montabone

Medvedev A. S. * Kuroda T. Hartogh P. Takahashi M.
Semiannual Oscillations in the Atmosphere of Mars **[#9047]**
We detect the semiannual oscillation (SAO) in the difference between the day- and night-time MGS temperatures, a good proxy for solar tides, and simulate it with a GCM. Our analysis revealed significant differences in driving mechanisms of the SAO on Mars and Earth.

Lawson W. G. * Richardson M. I.
Ensemble-based Data Assimilation with Mapping Datasets of the Martian Atmosphere **[#9115]**
A progress report on our effort to develop an ensemble-based data assimilation system suitable for use with the datasets and models typically studied by planetary atmospheric scientists.

Lewis S. R. * Montabone L. Read P. L. Rogberg P. Wilson R. J. Smith M. D.
Data Assimilation of Three Mars Years of Thermal Emission Spectrometer Observations: Large-Scale Transient and Stationary Waves **[#9009]**
Large-scale planetary waves are diagnosed by assimilating Thermal Emission Spectrometer (TES) temperature profile and total dust opacity retrievals into a Mars general circulation model to produce a physically self-consistent record of all atmospheric variables.

Wilson R. J. * Lewis S. R. Montabone L.
Thermal Tides in an Assimilation of Three Years of Thermal Emission Spectrometer Data from Mars Global Surveyor **[#9022]**
We present highlights of an analysis of the diurnally-varying components of temperature, surface pressure and near-surface winds present in the MGS reanalysis derived from TES temperature retrievals using the UK-MGCM assimilation model.

Zalucha A. M. * Plumb R. A. Wilson R. J.
A Mechanism for the Effect of Topography on the Martian Hadley Cells **[#9061]**
Previous studies have shown that the north-south slope in the martian topography is the cause of the asymmetry of the Hadley cells about the equator. We use a simple MGCM and Lindzen and Hou's (1988) Hadley cell model to provide an explanation.

Rogberg P. Read P. L. * Lewis S. R. Montabone L.
Assessing Atmospheric Predictability on Mars Using Numerical Weather Prediction and Data Assimilation **[#9062]**
A study of atmospheric predictability on Mars on timescales up to 30 sols, using initial states derived from assimilated observations of Mars from Mars Global Surveyor.

Martinez-Alvarado O. Moroz I. M. Read P. L. Lewis S. R. Montabone L. **(1-minute poster summary)**
A Diagnosis of Low-Order Dynamics in the Atmosphere of Mars **[#9048]**
The hypothesis of low-order behaviour underlying the martian atmospheric dynamics is explored by proper orthogonal decomposition (POD) and Fourier analysis, identifying POD-modes and components of motion such as thermal tides and transient waves.

Ogohara K. Satomura T. **(1-minute poster summary)**
Effects of CO_2 Condensation on Meridional Mass Flows in the Winter Polar Region **[#9021]**
Impacts of mass deposition due to CO_2 condensation on the zonal mean circulation are examined by a MGCM. The increase of meridional wind concentrates near the surface in high latitudes and is associated with Ekman transport in the boundary layer.

Sabato J. S. Rafkin S. C. R. **(1-minute poster summary)**
Eddy Driven Monsoon Theory Applied to Mars **[#9129]**
The apparent discrepancy between the near-conservation of angular momentum (a property of zonally symmetric flows) and the strong, zonally asymmetric nature of Mars' general circulation is examined.

Rogberg P. Read P. L. Lewis S. R. Montabone L. **(1-minute poster summary)**
Potential Vorticity, Angular Momentum and Inertial Instabilities in the Martian Atmospheric Circulation from Assimilated Analyses of MGS/TES **[#9104]**
Data based on re-analyses of the MGS/TES observations have been used to map distributions of potential vorticity and axial absolute angular momentum. Distribution of angular momentum and potential vorticity are closely related to the zonal-mean circulation.

Mlawer E. Eluszkiewicz J. Cady-Pereira K. Iacono M. J. Moncet J.-L. **(1-minute poster summary)**
Radiative Transfer Modeling of the Martian Atmosphere **[#9089]**
The status of AER's radiative transfer tools applicable to the modeling and remote sensing of the Mars atmosphere will be described.

Eluszkiewicz J. Flittner D. E. Moncet J.-L. Wolff M. J. **(1-minute poster summary)**
Development of Limb-scattering Radiative Transfer Models for Mars Remote Sensing and Data Assimilation **[#9031]**
The develoment of limb-scattering models for MCS, TES, and CRISM is outlined.

3:30 – 4:00 p.m. BREAK

Monday, November 10, 2008
MARS UPPER ATMOSPHERE
4:00 – 5:30 p.m.

Chair: M. A. Lopez-Valverde

Withers P. *
New Data Products from the Mars Odyssey Accelerometer: Report on Scientific Implications, Data Processing, Validation and Archiving **[#9035]**
New density profiles have been obtained from Mars Odyssey Accelerometer data acquired during aerobraking. Studies of small-scale structure caused by gravity waves, analysis of thermal tides, and comparisons to simulations will be reported.

Bougher S. W. * McDunn T. Forbes J. M.
Solar Cycle Variability of Mars Dayside Exospheric Temperatures: MTGCM Interpretation of MGS Drag Data **[#9064]**
The response of the Mars' exospheric temperatures to long-term solar flux changes was recently established using MGS drag data [Forbes et al. 2008]. New MGCM-MTGCM simulations are conducted to examine the key thermal balance processes responsible.

Huestis D. L. * Slanger T. G. Sharpee B. D. Cosby P. C. Fox J. L.
Analysis, Interpretation, and Modeling of Mars Dayglow Spectra **[#9071]**
Simultaneous analysis of data from the Mars Express and Mariner 6, 7, and 9 missions has better defined the altitude profiles of ultraviolet dayglow emissions, providing more demanding challenges to models of the Mars atmosphere from 80 to 200 km.

González-Galindo F. * Forget F. López-Valverde M. A. Angelats i Coll M. Millour E.
The Temperatures in the Thermosphere as Given by the LMD-MGCM: Variations and Comparisons with Data **[#9006]**
We use the LMD-MGCM, the first ground-to-exosphere Mars General Circulation Model, to study the temperature structure of the upper martian atmosphere, paying special attention to the different variability scales and to the comparison with available data.

Moudden Y. * Forbes J. M.
Non-Migrating Tides Connections with Topography and Surface Properties **[#9041]**
In this study we use a general circulation model in combination with the Mars Global Surveyor accelerometer measurements to isolate the different waves responsible for the observed density structures.

Lopez-Valverde M. A. * Gonzalez-Galindo F.
Fast Computation of CO_2 Cooling Rates for a Mars GCM **[#9085]**
We present a new parameterization of the radiative cooling rates by CO_2 at 15-micron in the martian atmosphere, specially designed to be implemented in Mars' global circulation models.

Espley J. R. Connerney J. E. C. Lillis R. J. **(1-minute poster summary)**
Effects of High Energy Astrophysical Events on the Martian Atmosphere **[#9110]**
We use results from a particle physics model to investigate the effects of gamma ray bursts on the martian atmosphere and compare those results to observations from the MAG/ER instrument on MGS.

Kutepov A. A. Feofilov A. G. Rezac L. Smith M. D. **(1-minute poster summary)**
Temperatures of Martian Atmosphere in the Altitude Region 60–100 km Retrieved from the MGS/TES Bolometer Infrared Limb Radiances **[#9070]**
We present retrievals of temperatures in the region 60–100 km from the TES limb thermal (5.5–100 μm) bolometer radiances for dust free atmospheric situations. The extension of retrieval technique on the dust storm conditions is discussed.

McDunn T. L. Bougher S. W. Murphy J. Smith M. D. Forget F. Bertaux J.-L. Montmessin F. **(1-minute poster summary)**

Structure and Dynamics of the 60–140 km Region on Mars **[#9060]**

This investigation utilizes the MEX/SPICAM dataset to validate and constrain the coupled multi-dimensional Mars General Circulation Model-Mars Thermosphere General Circulation Model (MGCM-MTGCM) at middle altitudes and explore the underlying physics governing these levels.

Lillis R. J. Bougher S. W. **(1-minute poster summary)**

Four Martian Years of Nightside Upper Thermospheric Mass Densities from Electron Reflectometry: Extending the Method to Northern Latitudes **[#9074]**

We present four martian years of neutral mass densities at 185 km altitude, derived from electron reflectometry, and compare with MTGCM predictions. Northern winter polar warming, as well as several "anomalous" events are reported.

Livengood T. A. Smith R. L. Kostiuk Th. Fast K. E. Maguire W. C. Hewagama T. **(1-minute poster summary)**

Probing the Temperature of Mars' Mesosphere **[#9124]**

Infrared heterodyne spectroscopy probing Mars' mesosphere in nadir viewing at high spectroscopic resolution.

Forbes J. M. Moudden Y. **(1-minute poster summary)**

Effects of Thermal Tides on the Mean Structure of Mars' Lower Thermosphere **[#9042]**

A general circulation model of Mars is used to elucidate the effects of thermal tides on the zonal mean density, temperature and wind structure between 90 and 160 km. The effects are substantial, and amount to order 10–40%, 10–30 K and 50–150 m/s, respectively.

Monday, November 10, 2008
POSTER SESSION
5:30 – 7:30 p.m.

Mars Atmosphere General Circulation and Climate: Observations

Sornig M. Sonnabend G. Kroetz P. J. Stupar D. Schieder R.
Potential of High Resolution Mid-Infrared Heterodyne Spectroscopy to Study the Martian Atmosphere **[#9050]**

Banfield D. Kleinbohl A. Schofield J. T. Kass D. M. McCleese D. J. MCS Team
Traveling and Forced Waves from MRO MCS **[#9063]**

Mischna M. A. Kass D. M. Friedson A. J. Schofield J. T. Kleinböhl A. Zurek R. W. Tamppari L. K. Formisano V. PFS Team MCS Team
An Intercomparison of PFS and MCS Temperature Profiles in Support of Mars Phoenix EDL **[#9091]**

Mars General Circulation and Climate: Models

Martinez-Alvarado O. Moroz I. M. Read P. L. Lewis S. R. Montabone L.
A Diagnosis of Low-Order Dynamics in the Atmosphere of Mars **[#9048]**

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Radiative Transfer Modeling of the Martian Atmosphere **[#9089]**

Eluszkiewicz J. Flittner D. E. Moncet J.-L. Wolff M. J.
Development of Limb-scattering Radiative Transfer Models for Mars Remote Sensing and Data Assimilation **[#9031]**

Mars Upper Atmosphere

Espley J. R. Connerney J. E. C. Lillis R. J.
Effects of High Energy Astrophysical Events on the Martian Atmosphere **[#9110]**

Kutepov A. A. Feofilov A. G. Rezac L. Smith M. D.
Temperatures of Martian Atmosphere in the Altitude Region 60–100 km Retrieved from the MGS/TES Bolometer Infrared Limb Radiances **[#9070]**

McDunn T. L. Bougher S. W. Murphy J. Smith M. D. Forget F. Bertaux J.-L. Montmessin F.
Structure and Dynamics of the 60–140 km Region on Mars **[#9060]**

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Livengood T. A. Smith R. L. Kostiuk Th. Fast K. E. Maguire W. C. Hewagama T.
Probing the Temperature of Mars' Mesosphere **[#9124]**

Forbes J. M. Moudden Y.
Effects of Thermal Tides on the Mean Structure of Mars' Lower Thermosphere **[#9042]**

Mesoscale and Microscale

Martínez G. M. Valero F. Vázquez L.
Martian Planetary Boundary Layer Characterization Under Convective Conditions **[#9002]**

Petrosyan A. Galperin B. Gundersson K. Larsen S. Lewis S. Read P. Renno N. Richardson M. Rogberg P. Savijarvi H. Seiferlin K. Siili T. Thomas N. Toigo A.
The ISSI International Study Team on the Martian PBL — Status Report and Plan **[#9100]**

Odaka M. Yamashita T. Sugiyama K. Nakajima K. Ishiwatari M. Hayashi Y.-Y.
Development of a Three Dimensional Non-Hydrostatic Model for MartianAtmosphere and a Numerical Simulation of Thermal Convection **[#9105]**

Barnes J. R. Tyler D. Hinson D. P.
The Depth of the Daytime Convective Boundary Layer on Mars: A Case of Extremes **[#9076]**

Sun X. Taylor P. A.
Slope Winds on Mars in Relation to the Phoenix Lander Mission **[#9053]**

Spiga A. Forget F.
A New Method to Estimate the Solar Irradiance on Martian Slopes **[#9015]**

Water, Clouds, and Dust

Stenzel O. J. Hoekzema N. M. Markiewicz W. J. Keller H. U.
Correction of HRSC Images for Atmospheric Dust Using a Simple Optical Depth Retrieval Method **[#9112]**

Määttänen A. Fouchet T. Forni O. Forget F. Savijärvi H. Melchiorri R. Langevin Y. Gondet B. Formisano V. Giuranna M. Bibring J.-P.
A Study of Dust Properties from a Dust Storm Seen by MEx/OMEGA and MEx/PFS **[#9004]**

Vincendon M. Langevin Y. Bibring J.-P. Fouchet T. Gondet B. Jouglet D. Poulet F.
The Vertical Structure of Martian Aerosols Explored Using a 3D Spherical Monte-Carlo Model and Observations at the Terminator by OMEGA **[#9059]**

Heavens N. G. Richardson M. I. McCleese D. J. MCS Science Team
A New Perspective on the Vertical Distribution of Dust in the Martian Atmosphere During Northern Summer from Mars Climate Sounder: Elevated Maxima in Density-scaled Opacity over the Tropics **[#9066]**

McConnochie T. H. Smith M. D.
Vertically Resolved Aerosol Climatology from Mars Global Surveyor Thermal Emission Spectrometer (MGS-TES) Limb Sounding **[#9114]**

Meslin P.-Y. Forget F. Millour E.
An Improved Model of Regolith-Atmosphere Exchange of Water Vapor in the LMD Global Climate Model **[#9111]**

Mars Seasonal Polar Caps

James P. B. Bonev B. P.
Effect of Atmospheric Dust on Interannual Variability in the Martian South Polar Cap **[#9051]**

Trace Species and Photochemistry

Altieri F. Zasova L. Montabone L. Spiga A. Bellucci G. Bibring J.-P.
Waves Patterns Traced by Ozone on Mars Polar Regions **[#9056]**

Atmospheric Sciences to Understand the Past of Mars

Kadish S. J. Head J. W. Forget F. Fastook J. L. Marchant D. R.
Decoding the Climate Signal in the Tharsis Montes Fan-shaped Deposits: The Dynamics of Tropical Mountain Glaciers **[#9030]**

Reference Atmospheres, Database and Entry, Descent, Landing Issues

Ferri F. Lewis S. R. Ball A. J. Colombatti G. Aboudan A. Angrilli F. Müller-Wodarg I. Hathi B. Leese M. R. Zarnecki J. C. EDLS Science Team
ExoMars Entry and Descent Science **[#9010]**

De Angelis G. Badavi F. F. Blattnig S. R. Clowdsley M. S. Qualls G. D. Singleterry R. C. Jr. Wilson J. W.
Updated Time-Dependent Models for the Mars Radiation Environment **[#9011]**

Marzo G. A. Lopez-Valverde M. A. Gonzales-Galindo F.
Cluster Analysis of Martian Atmospheric Temperature Profiles **[#9081]**

Tuesday, November 11, 2008
MESOSCALE AND MICROSCALE: NEWS FROM PHOENIX, MER, AND MODELING
9:00 – 11:40 a.m.

Chairs: M. Richardson
N. Renno

Taylor P. A. * Gunnlaugsson H. P. Holstein-Rathlou C. Lange C. F. Moores J. Cook C. Dickinson C. Popovici V. Seabrook J. Whiteway J. **(Invited, 20 minutes)**
Phoenix: Summer Weather in Green Valley (126W, 68N on Mars) **[#9024]**
Near continuous measurements of temperatures and pressure [1] on the Phoenix Lander and winds from the Telltale [2] are used to indicate the typical daily cycles of temperature, pressure and winds at the Phoenix site (126W, 68N) during mid summer on Mars.

Davy R. * Taylor P. A. Gunnlaugson H. P. Davis J. A. Lange C. F. Weng W.
Temperature and Wind Data from the Phoenix MET Station and Their use in Estimating Turbulent Heat Fluxes **[#9079]**
Spectral analysis of stable and unstable temperature data. Estimating turbulent parameters and surface heat flux. Lander influences and possible corrections.

Ellehøj M. D. Taylor P. A. * Gunnlaugsson H. P. Gheynani B. T. Holstein-Rathlou C. Drube L. Whiteway J.
Phoenix: Dustless Devils at the Lander Site **[#9026]**
Masurements of pressure are used to identify the passage of vortex structures at the Phoenix site on Mars. LES modelling of highly convective boundary layers shows that vertically oriented vortices with low pressure, warm cores, can develop on internal boundaries.

Michaels T. I. Rafkin S. C. R. *
MRAMS Today — One Example of Current Mars Mesoscale Modeling Capabilities **[#9116]**
A summary of notable changes and additions to the nonhydrostatic Mars Regional Atmospheric Modeling System (MRAMS) since its introduction in 2001. Intended to exemplify the impressive capabilities that current and future mesoscale models may possess.

Barnes J. R. * Tyler D. **(Invited, 20 minutes)**
The OSU Mars Mesoscale and LES Models: A Status Report **[#9097]**
The current status of developments and studies involving the OSU Mars Mesoscale Model and the OSU Mars LES Model will be discussed.

Martínez G. M. Valero F. Vázquez L. **(1-minute poster summary)**
Martian Planetary Boundary Layer Characterization Under Convective Conditions **[#9002]**
An extensive study of the magnitudes characterizing the convective Martian Planetary Boundary Layer (MPBL) at the Viking Lander 1, Viking Lander 2, and Pathfinder sites has been carried out.

Petrosyan A. Galperin B. Gundersson K. Larsen S. Lewis S. Read P. Renno N. Richardson M. Rogberg P. Savijarvi H. Seiferlin K. Siili T. Thomas N. Toigo A. **(1-minute poster summary)**
The ISSI International Study Team on the Martian PBL — Status Report and Plan **[#9100]**
An ISSI Mars PBL study team including theorists, modelers, and those with experience in the analysis of martian and terrestrial boundary layer data has been assembled and started its work in 2008. Team's work plan and status report are presented.

Odaka M. Yamashita T. Sugiyama K. Nakajima K. Ishiwatari M. Hayashi Y.-Y. **(1-minute poster summary)**
Development of a Three Dimensional Non-Hydrostatic Model for MartianAtmosphere and a Numerical Simulation of Thermal Convection **[#9105]**
We develop a three dimensional non-hydrostatic model and perform a numerical simulation of thermal convection in the martian atmosphere without background wind and dust radiative heating.

Barnes J. R. Tyler D. Hinson D. P. **(1-minute poster summary)**
The Depth of the Daytime Convective Boundary Layer on Mars: A Case of Extremes **[#9076]**
The spatial distribution and seasonal variation in the depth of the convective boundary layer on Mars is examined using mesoscale and LES modeling, along with observational data.

Sun X. Taylor P. A. **(1-minute poster summary)**
Slope Winds on Mars in Relation to the Phoenix Lander Mission **[#9053]**
Measurements reported from the Phoenix mission by Taylor et al. (also submitted) suggest that slope winds may explain some of the observed features. A simple 1-D model of slope winds on Earth has been adapted to Mars conditions to investigate this possibility.

10:30 – 11:00 a.m. BREAK

Spiga A. * Forget F. Montabone L.
Study of the Martian Boundary Layer, Mountain Meteorology and 2001 Dust Storm with the LMD Mesoscale Model **[#9028]**
Insights on the martian boundary layer, mountain meteorology and 2001 dust storm are presented from simulations by the new LMD mesoscale model.

Toigo A. Siili T. * Richardson M.
Equatorial Near-Surface Atmospheric Temperature Profiles: Opportunity Mini-TES Observations and High-Resolution MarsWRF Simulations **[#9118]**
Simulations of the PBL at the Opportunity MER landing site were made with the planetWRF atmospheric model in LES mode. Comparison to Mini-TES temperature data and focus on the structure of convection and length scales of transport will be presented.

Wolkenberg P. M. * Formisano V. Rinaldi G. D'Amore D. Geminale A. Montabone L.
Spiga A. Michaels T. I.
An Atmospheric Hot Ring Around Olympus Mons — Comparison with Mesoscale Models (LMD and MRAMS) **[#9126]**
We report about a recent discovery made with PFS-MEX data on Olympus Mons. In certain seasons and local times, we observe two temperature increases, one located to the north of the volcano and one located to the south, from the surface up to 15 km.

Spiga A. Forget F. **(1-minute poster summary)**
A New Method to Estimate the Solar Irradiance on Martian Slopes **[#9015]**
We propose an accurate and computationally efficient method to calculate, in a Mars-like dusty atmosphere, the solar irradiance reaching an inclined surface assuming the value in the horizontal case is known.

Tuesday, November 11, 2008
WATER, CLOUDS, AND DUST: WATER VAPOR
11:40 a.m. – 12:30 p.m.

Chair: N. Renno

Smith M. D. * Wolff M. J. Clancy R. T. CRISM Science Team **(Invited, 20 minutes)**
CRISM Observations of Water Vapor and Carbon Monoxide **[#9094]**
One full martian year of near-infrared spectra returned by CRISM on-board MRO are used to show the seasonal and latitudinal dependence of water vapor abundance and carbon dioxide mixing ratio.

Villanueva G. L. * Mumma M. J. Novak R. E. Hewagama T. Bonev B. P. DiSanti M. D.
Mapping the D/H of Water on Mars Using High-Resolution Spectroscopy **[#9101]**
We mapped H_2O and HDO on Mars in March/April 2008 and March 2003 using high-resolution infrared spectroscopy with CSHELL at NASA-IRTF.

Melchiorri R. * Drossart P. Fouchet T. Encrenaz T. Forget F. Titov D. Maltagliati L. Altieri F. Vincedom M. Langevin Y. Bibring J.-P.
OMEGA/Mars Express: South Pole Region, Water Vapor Daily Variability **[#9068]**
We report on a daily variability of water vapor on the South Pole Region (SPR), observed by OMEGA/MEx during the southern spring-summer period (LS 250–270) outside the CO_2 ice cap. We have been able to observe an increase of few ppt-μm during the day.

12:30 – 2:00 p.m. LUNCH

Tuesday, November 11, 2008
WATER, CLOUDS, AND DUST: WATER VAPOR (continued)
2:00 – 2:48 p.m.

Chair: M. Wolff

Fedorova A. * Korablev O. Bertaux J.-L. Rodin A. Montmessin F. Reberac A.
Vertical Distributions of Water Vapor and Aerosol in the Martian Atmosphere by SPICAM-IR Spectrometer on Mars-Express **[#9087]**
We report results of solar occultation study of the martian atmosphere performed by SPICAM IR AOTF spectrometer onboard the Mars-Express mission.

Hollingsworth J. L. * Kahre M. A. Haberle R. M.
Mars' Southern Hemisphere: Influences of the Great Impact Basins on Extratropical Weather and the Water Cycle **[#9117]**
Large-scale extratropical weather disturbances in Mars' southern hemisphere are influenced by the great impact basins which have implications for the poleward transports of heat, momentum and atmospheric tracers (water and dust).

Tyler D. * Barnes J. R.
Mesoscale Model Simulation of the Sublimation and Transport of Water from the North Polar Residual Ice Cap **[#9083]**
The OSU MMM5 is now examining the sublimation of NPRC water ice and its transport by the atmosphere. Proof of concept runs are complete; and, these, already, are instructive. Ongoing model development will lead to many more results being presented.

Renno N. O. * Clark B. C. Drube L. Fisher D. Goetz W. Hecht M. Keller H. U. Kounaves S. Lemmon M. Madsen M. B. Marshall J. Mehta M. Mellon M. Smith M. Smith P. H. Stoker C. Tamppari L. Wood S. Young S. M. Zent Z.
Physical and Thermodynamical Evidence of Liquid Water on Mars **[#9127]**
We show evidence that liquid saline-water currently exists on Mars. Moreover, we show that the thermodynamics of freezing/thaw cycles leads to the formation of saline solutions with freezing temperatures much higher than currently found on most of Mars.

Tuesday, November 11, 2008
WATER, CLOUDS, AND DUST: DUST AND CLOUD OBSERVATIONS
2:48 – 6:00 p.m.

Chairs: M. J. Wolff
M. Mischna

Whiteway J. * Dickinson C. Cook C. Komguem L. Illnicki M. Popovici V. Seabrook J. Daly M. Carswell A. **(Invited, 20 minutes)**

Phoenix Lidar Measurements of Atmospheric Dust and Clouds **[#9027]**

The lidar on the Phoenix mission measured the vertical distribution of dust and clouds in the atmosphere of Mars. The presentation will focus on the observed clouds and the analysis to estimate ice water content.

Davy R. * Pathak J. Taylor P. A. Weng W. Whiteway J.

On Modeling Boundary-Layer Depths, Dust and Cloud at the Phoenix Lander Site **[#9080]**

A 1-D coupled atmospheric boundary-layer model and Mars microphysical model have been used to investigate atmospheric dust and water-ice distributions at the Phoenix lander site with application to the interpretation of LIDAR results.

Stenzel O. J. Hoekzema N. M. Markiewicz W. J. Keller H. U. **(1-minute poster summary)**

Correction of HRSC Images for Atmospheric Dust Using a Simple Optical Depth Retrieval Method **[#9112]**

A simple scheme is introduced to estimate the optical depth present in the martian atmosphere during a Mars Express HRSC observation.

3:30 – 4:00 p.m. BREAK

Cantor B. A. * Malin M. C. Wolff M. J. Haberle R. M. James P. B. Clancy R. T. Lee S. W. MARCI Science Team **(Invited, 20 minutes)**

Observations of the Martian Atmosphere by MRO-MARCI, An Overview of 1 Mars Year **[#9075]**

MRO-MARCI provides another opportunity to study martian weather phenomena, ranging from dust devils and dust storms to condensate clouds to ozone to the seasonal behavior of the polar caps, all on time scales ranging from diurnally to interannually.

Heavens N. G. * Richardson M. I. McCleese D. J. Kleinböhl A.
Mars Climate Sounder Science Team **(Invited, 20 minutes)**

A New Perspective on the Vertical Distribution of Dust in the Martian Atmosphere in Northern Summer from Mars Climate Sounder: Zonally-averaged Profiles **[#9065]**

This study will discuss zonally averaged profiles of dust opacity retrieved from observations by Mars Climate Sounder, their novel features, and summarize their compact representation for purposes of analysis and prescribed dust forcings in meteorological models.

Clancy R. T. * Wolff M. J. Whitney B. A. Smith M. D. Cantor B. A.

High Altitude Dust Global Distribution, Vertical Mixing, and Particle Sizes During the 2001 Planet-encircling Dust Storm **[#9084]**

Dust was suspended to altitudes as high as 80 km during the 2001 dust storm, exhibiting extreme longitudinal variations, altitude increasing mixing ratios, and =1.5 μm particle radii. These indicate vigorous vertical and meridional transport rates at 40–80 km altitudes.

OMEGA Team Vincendon M. * Langevin Y. Poulet F. Pommerol A. Wolff M. J. Bibring J.-P. Gondet B. Jouglet D.

Albedo Changes on Mars: The Role of Dust Aerosols as Seen by OMEGA **[#9058]**

We have studied the apparent variations of low albedo surfaces using OMEGA near-IR data and a radiative transfer model. Changes are primarily due to aerosols while dust deposits play only a minor role.

Wolff M. J. * Clancy R. T. Smith M. D. Arvidson R. E. Kahre M. Seelos F. IV
Morris R. V. CRISM Science Team
Wavelength Dependence of the Dust Aerosol Single Scattering Albedo as Observed by MRO/CRISM **[#9125]**
The very dusty martian atmosphere during the 2007 perihelion season offers an excellent opportunity to revisit the microphysical nature of dust aerosols through the use of CRISM "emission phase function" sequences.

Gondet B. * Bibring J.-P. Langevin Y. Poulet F. Montmessin F. Forget F.
Martian Clouds Detected by OMEGA/Mars Express **[#9046]**
H_2O and CO_2 clouds are major contributors to the global atmospheric circulation processes. Through the monitoring of their evolution over martian years, OMEGA contributes to understand the microphysics involved.

Määttänen A. * Montmessin F. Gondet B. Hoffmann H. Scholten F. Hauber E.
Bibring J.-P. Neukum G.
Equatorial CO_2 Clouds on Mars: OMEGA and HRSC Data Analysis **[#9005]**
In this study we have used observations by MEx/OMEGA and MEx/HRSC to analyse equatorial CO_2 cloud occurrences as well as some properties of the clouds (altitude, particle size, opacity). We will present the results acquired so far using the two datasets.

Määttänen A. Fouchet T. Forni O. Forget F. Savijärvi H. Melchiorri R. Langevin Y. Gondet B.
Formisano V. Giuranna M. Bibring J.-P. **(1-minute poster summary)**
A Study of Dust Properties from a Dust Storm Seen by MEx/OMEGA and MEx/PFS **[#9004]**
Our project aims at providing new constraints on the optical properties of martian dust using observations of a local dust storm observed by OMEGA and PFS aboard the Mars Express spacecraft.

Vincendon M. Langevin Y. Bibring J.-P. Fouchet T. Gondet B. Jouglet D.
Poulet F. **(1-minute poster summary)**
The Vertical Structure of Martian Aerosols Explored Using a 3D Spherical Monte-Carlo Model and Observations at the Terminator by OMEGA **[#9059]**
We present a spherical model of radiative transfer through airborne particles based on Monte-Carlo methods. We analyze OMEGA observations at the day/night limit to study the vertical distribution of aerosols (water ice layers, dust scale height).

Heavens N. G. Richardson M. I. McCleese D. J. MCS Science Team **(1-minute poster summary)**
A New Perspective on the Vertical Distribution of Dust in the Martian Atmosphere During Northern Summer from Mars Climate Sounder: Elevated Maxima in Density-scaled Opacity over the Tropics **[#9066]**
This study investigates the longitudinal variability and origins of a persistent elevated maximum in density-scaled dust opacity (a proxy for mass mixing ratio) over Mars' tropics during northern summer.

McConnochie T. H. Smith M. D. **(1-minute poster summary)**
Vertically Resolved Aerosol Climatology from Mars Global Surveyor Thermal Emission Spectrometer (MGS-TES) Limb Sounding **[#9114]**
We present a new aerosol data set based on TES limb-sounding observations.

Wednesday, November 12, 2008
WATER, CLOUDS, AND DUST: UNDERSTANDING THE DUST CYCLE
9:00 – 10:30 a.m.

Chair: M. Kahre

Wilson R. J. * Haberle R. M. Noble J. Bridger Å. F. C. Schaeffer J. Barnes J. R.
Cantor B. A. **(Invited, 20 minutes)**
Simulation of the 2001 Planet-encircling Dust Storm with the NASA/NOAA Mars General Circulation Model **[#9023]**
This paper describes a synthesis of MOC imagery and TES opacity and temperature retrievals and the use of a Mars general circulation model to investigate aspects of the initiation and evolution of the 2001 planet encircling dust storm.

Montabone L. * Martinez-Alvarado O. Lewis S. R. Read P. L. Wilson R. J.
Teleconnection in the Martian Atmosphere During the 2001 Planet-encircling Dust Storm **[#9077]**
In this paper we report on the dynamical events that connected distant favourable dust lifting regions and activated secondary lifting centers thousands of kilometers apart during the 2001 planet-encircling dust storm.

Walter C. Austin G. L. *
Dust Storm Prediction with the Auckland Mars Mesoscale Model GM4 **[#9001]**
The University of Auckland Global Mars Mesoscale Meteorological Model (GM4) has been used to study the annual variation of the weather in two study sites in order to find a correlation between local atmospheric conditions and the occurrence of local dust storms.

Rafkin S. C. R. *
Tropical Dust Cyclones on Mars **[#9034]**
A positive feedback process between local dynamics and radiative forcing of dust is explained by geostrophic adjustment theory and a mechanism related to the wind-induced sensible heat exchange hypothesis for tropical cyclones.

Richardson M. I. * Vasavada A. R.
The Dust Cycle and the Surface: Insight from TES Albedo Measurements **[#9119]**
We review MGS TES observations of the changes in surface albedo. These are mostly due to dust cover. The global storm of 2001 dominated changes in albedo. No significant brightness differences between MGS and Viking.

Hébrard E. * Coll P. Marticorena B. Bergametti G. Montmessin F. Forget F.
An Aerodynamic Roughness Map Derived from Martian Rock Abundance Data and its Effects on Aeolian Erosion Thresholds in a MGCM **[#9057]**
We have applied to Mars a recent physical model designed to account for the influence of the surface characteristics on the spatio-temporal variability of dust emission in arid terrestrial environments.

10:30 – 11:00 a.m. BREAK

Wednesday, November 12, 2008
WATER, CLOUDS, AND DUST: UNDERSTANDING CLOUDS
11:00 – 11:50 a.m.

Chair: P. Read

Madeleine J.-B. * Forget F. Millour E. Spiga A. Montmessin F. Bibring J.-P. Gondet B. Jouglet D. Vincendon M. Langevin Y. Schmitt B.
Microphysics and Radiative Effect of Water Ice Clouds on Mars: Modeling with the LMD/GCM and insights from the OMEGA/MEx Data Set **[#9013]**
Radiatively active water ice clouds of varying effective radius have been implemented in the LMD/GCM. Resulting water cycle has been compared to the TES/MGS observations, and to cloud particle size and NIR opacity retrieved from the OMEGA/MEx data set.

Verhoeven C. * Daerden F. Moreau D. Akingunola A. McConnell J. C. Kaminski J. W. Larsen N.
Study of Ice Cloud Formation and Evolution in the Tropical Cloud Belt with a Detailed Microphysical Model **[#9045]**
We present a 1D detailed microphysical model for the martian dust and water ice clouds driven by the 3D MGCM GM3 and compare the results obtained in the Tropical Cloud Belt with SPICAM data.

Daerden F. * Verhoeven C. Moreau D. Kaminski J. W. McConnell J. C. Akingunola A. Larsen N.
Influence of Detailed Microphysics on Cloud Formation in a Mars GCM **[#9038]**
The GM3 bulk condensation scheme is compared to a newly developed detailed microphysical description in order to estimate the influences of simplified schemes on ice cloud formation in Mars GCMs.

Kuroda T. * Hartogh P. Sakai D. Takahashi M.
Simulation of the Water Cycle on Mars in the CCSR/NIES/FRCGC MGCM **[#9049]**
Here we show first results of our three-dimensional water cycle simulations in a MGCM with a simple water cycle scheme. The model reproduces consistent changes of hygropause in different season and dust opacity with observations.

Meslin P.-Y. Forget F. Millour E. **(1-minute poster summary)**
An Improved Model of Regolith-Atmosphere Exchange of Water Vapor in the LMD Global Climate Model **[#9111]**
We present an improved regolith-atmosphere exchange model used in the LMD Global Circulation Model to better represent the water cycle.

Wednesday, November 12, 2008
MARS SEASONAL POLAR CAPS: CO_2 ICE AND H_2O FROST
11:50 a.m. – 12:30 p.m.

Chair: P. Read

Hayne P. * Paige D. A. **(Invited, 20 minutes)**
Mars Polar Cold Spots Observed by MRO/Mars Climate Sounder **[#9121]**
Using radiometric observations from the Mars Climate Sounder (MCS) during southern winter, we report evidence that polar cold spots (T_b < 135 K) at Mars' south pole are correlated with tropospheric, optically thick clouds.

Eluszkiewicz J. * Moncet J.-L. Shephard M. W. Cady-Pereira K. Connor T. Uymin G.
Atmospheric and Surface Retrievals in the Mars Polar Regions from the Thermal Emission Spectrometer Measurements **[#9032]**
Simultaneous retrievals of atmospheric and surface parameters in the Mars polar regions are described.

12:30 – 2:00 p.m. LUNCH

Wednesday, November 12, 2008
MARS SEASONAL POLAR CAPS: CO_2 ICE AND H_2O FROST (continued)
2:00 – 3:30 p.m.

Chair: J. Eluszkiewicz

Langevin Y. * Vincendon M. Poulet F. Gondet B. Bibring J.-P. Douté S. Seelos K. Titus T. Murchie S. **(Invited, 20 minutes)**

Retreat of the North Seasonal Cap of Mars Observed by OMEGA and CRISM **[#9012]**

OMEGA/MEX has now observed the retreat of the northern seasonal cap over three martian years. A coordinated campaign with OMEGA and CRISM/MRO has provided new information on the complex sublimation processes during the retreat of the north seasonal cap.

Appéré T. * Schmitt B. Pommerol A. Douté S. Beck P. Forget F. Schmidt F. Langevin Y. Bibring J.-P. Gondet B.

Spatial and Temporal Distributions of the Water Ice Annulus During Recession of the Northern Seasonal Condensates on Mars **[#9008]**

Spatial extent and temporal evolutions of the water ice annulus surrounding the CO_2-rich ice deposits during recession of the northern seasonal condensates (OMEGA/Mars Express observations).

Schmidt F. Schmitt B. * Douté S. Forget F. Langevin Y. Bibring J.-P. OMEGA Team

Asymmetric Release of CO_2 During Southern Spring **[#9003]**

Observations in VIS and IR have shown that the sublimation of the Seasonal South Polar Cap (SSPC) is asymmetric. We calculate the asymmetric release of CO_2 using a sublimation model and discuss implications for the martian atmosphere (wind, argon).

Titus T. N. * Michaels T. I. Colaprete A. Kieffer H. H. Langevin Y. Murchie S. L. Vincendon M. CRISM Science Team

Exotic Processes within the Cryptic Region of Mars: A New Method for Near Real-Time Estimates of Wind Direction **[#9043]**

Observations of the southern seasonal cap have revealed the presence of exotic features. Many of these features, including fans, are the result of cold CO_2 jets. Fans provide real-time wind directions, thus providing ground-truth for validating atmospheric models.

Chevrier V. F. * Bryson K. Roe L. A. Blackburn D. G. White K. F.

Sublimation Kinetics of CO_2 Ice and Evolution of the Martian Polar Caps **[#9073]**

We show that sun insolation drives CO_2 ice sublimation on the martian poles. Due to eccentricity the southern perennial cap looses 0.3–0.4 m every year, as shown by MOC and HiRISE images. The south CO_2 perennial cap will disappear in three martian years.

Kahre M. A. * Haberle R. M. Hollingsworth J. L. Murphy J. R.

Understanding the Repeatable Nature of the Viking Surface Pressure Curves: Coupling Mars' CO_2 and Dust Cycles **[#9093]**

We utilize a Mars GCM to investigate interactions between Mars' dust and CO_2 cycles with the goal of understanding the repeatable nature of the Viking surface pressure curves.

James P. B. Bonev B. P. **(1-minute poster summary)**

Effect of Atmospheric Dust on Interannual Variability in the Martian South Polar Cap **[#9051]**

The MY 28 perihelic dust event on Mars resulted in changes in CO_2 deposits in the vicinity if the RSPC. This work investigates whether the larger perihelic storm seen by MY 9 could effect the differences in the RSPC viewed by Mariner 9 and subsequent missions.

3:30 – 4:00 p.m. BREAK

Wednesday, November 12, 2008
TRACE SPECIES AND PHOTOCHEMISTRY
4:00 – 5:40 p.m.

Chair: F. Lefevre

Sprague A. L. Boynton W. V. * Colaprete A. Janes D. M. Metzger A. Ê. Kerry K. E. Forget F. Starr R. Haberle R. M.

GRS Measurements of Mars' Atmospheric Argon: Effects of Updated Mars Model Atmospheres on Concentration Computations **[#9098]**

Mars' atmospheric Ar concentrations for seasonal and geographically resolved measurements by the GRS on Mars Odyssey are discussed. No GCM has reproduced the Ar results — we will show new analyses using upgraded GCM model atmospheres from NASA and LMD.

Economou T. E. *

Mars Atmosphere Argon Density Measurement on MER Mission **[#9102]**

Using the Alpha Particle X-ray Spectrometer (APXS) on board Spirit and Opportunity rovers on MER mission, we were able to measure the argon density variation in the martian atmosphere as a function of seasonal changes.

Forget F. * Millour E. Montabone L. Lefevre F.

Non Condensable Gas Enrichment and Depletion in the Martian Polar Regions **[#9106]**

The local enrichment and depletion of non-condensable gas like argon resulting from the condensation-sublimation of CO_2 in the polar regions is simulated in details in the LMD GCM. Results are in good agreement with the GRS argon observations.

GRS Team Meslin P.-Y. * Boynton W. V. Sabroux J.-C. Forget F. Chassefière E. Gasnault O. Pineau J. F. Metzger A. E. Janes B.

New Evidence of the Presence of Radon in the Martian Atmosphere and Perspective of Use as a Geophysical Tracer **[#9122]**

We present some new evidence of the presence of radon in the martian atmosphere based on Mars Odyssey GRS measurements and present its potential use as a geophysical tracer.

Haberle R. M. * Pilorget C. Wolff M. Lefèvre F. Forget F.

Seasonal and Spatial Variability of Ozone as Inferred from MARCI UV Data **[#9109]**

We use the MARCI B6/B7 ratios to qualitatively estimate the seasonal and spatial variations of column ozone abundances.

Fast K. E. * Kostiuk T. Hewagama T. Livengood T. A. Lefèvre F. Annen J. Delgado J. D.

Probing the Distribution of Ozone on Mars **[#9108]**

We present the application of HIPWAC line shapes of ozone on Mars to those produced by radiative transfer modeling of ozone profiles predicted by general circulation models, and to contemporaneous column abundances measured by Mars Express SPICAM.

Encrenaz T. * Greathouse T. K. Bitner M. Kruger A. Richter M. J. Lacy J. H. Bézard B. Fouchet T. Lefevre F. Forget F. Atreya S. K.

Ground-based Infrared Observations of Water Vapor and Hydrogen Peroxide in the Atmosphere of Mars **[#9018]**

Ground-based observations of water vapor and hydrogen peroxide have been obtained in the thermal infrared range, using the TEXES instrument at the NASA Infrared Telescope Facility, for different times of the seasonal cycle.

Altieri F. Zasova L. Montabone L. Spiga A. Bellucci G. Bibring J.-P. **(1-minute poster summary)**

Waves Patterns Traced by Ozone on Mars Polar Regions **[#9056]**

In this paper we report on atmospheric wave patterns traced by O_2 emission at 1.27 μm in the OMEGA data. The wave patterns have been observed over the polar regions of both hemispheres in the respective late winter/early spring.

Thursday, November 13, 2008
TRACE SPECIES AND PHOTOCHEMISTRY (CONTINUED)
9:00 – 10:40 a.m.

Chair: R. T. Clancy

Krasnopolsky V. A. * **(Invited, 20 minutes)**
Some Results of Ground-based High-Resolution Spectroscopy of the Martian Atmosphere **[#9040]**
This is a summary of recent observations of the O_2 dayglow at 1.27 μm, CO mixing ratio, methane, and oxygen and carbon isotope ratios on Mars.

Novak R. E. * Mumma M. J. Villanueva G. Bonev B.
Maps of the $O_2(^1\Delta)$ Emission During the Mars Pre-Aphelion Season **[#9107]**
Maps of the $O_2(^1\Delta)$ emission during the Mars pre-aphelion season for five seasonal dates between Ls = 333° and Ls = 67° are presented. No detectible emissions occur at Ls = 333°, but they are strong at all observable latitudes at Ls = 50° and Ls = 67°.

McConnell J. C. * Kaminski J. W. Akingunola A. Abbas M. Daerden F. Moudden Y. Hirst S.
A Comparison of Measurements of $O_2(^1\Delta)$ and NO Airglow with Calculations from GM3 **[#9092]**
Chemical modelling of Mars and comparison of NO airglow measurements with GM3 model results.

González-Galindo F. * Gilli G. López-Valverde M. A. Forget F. Leblanc F.
Nitrogen and Ionospheric Chemistry in the Thermospheric LMD-MGCM **[#9007]**
The thermospheric LMD-MGCM chemistry has been extended and includes nitrogen species and a simple ionosphere. This allows for comparisons with datasets such as the NO nightglow observations by SPICAM and the electron density profiles obtained by MGS and MaRS on Mars Express.

Mumma M. * Villanueva G. Novak R. E. Hewagama T. Bonev B. P. DiSanti M. A.
Smith M. D. **(Invited, 20 minutes)**
Absolute Measurements of Methane on Mars: The Current Status **[#9099]**
Our study of methane on Mars now includes all seasons, with significant spatial coverage. When present, CH_4 occurs in extended plumes whose latitudinal profiles show marked maxima, consistent with release from discrete regions. Details are discussed.

Lefèvre F. * Forget F.
GCM Simulations of Martian Methane **[#9017]**
We present three-dimensional simulations of methane on Mars with the LMD general circulation model. Methane variations caused by photochemistry, transport, and CO_2 cycle are discussed for various emission scenarios.

10:40 – 11:10 a.m. BREAK

Thursday, November 13, 2008
ATMOSPHERIC SCIENCES TO UNDERSTAND THE PAST OF MARS
11:10 a.m. – 12:30 p.m.

Chair: V. Chevrier

Head J. W. * **(Invited, 20 minutes)**
Water as a Clue to the Evolution of the Atmosphere and Climate History of Mars: Evidence for Circum-Polar/Non-Polar Ice Deposits, Running Water and Standing Bodies of Water in the History of Mars **[#9069]**
New data on geological deposits and processes provide insight into the history of the atmosphere and the climate of Mars and can be used to help formulate general circulation models to explore and understand the nature and evolution of the atmosphere and climate.

Kerber L. * Head J. W.
The Dispersal of Pyroclasts in the Martian Atmosphere **[#9020]**
Modeling of the transport of pyroclasts in the Martian atmosphere from Apollinaris Patera and the Tharsis volcanoes using an eruption model for martian conditions coupled with a Global Circulation Model (GCM).

Levine J. S. * Summers M. E.
Sulfur Dioxide and the Production of Sulfuric Acid on Present-Day and Early Mars: Implications for the Lack of Detected Carbonates on the Surface **[#9016]**
During the Tharsis formation, we estimate that about 1 bar of sulfur dioxide was released to the atmosphere. The chemical transformation of sulfur dioxide to sulfuric acid in the present-day and early atmosphere of Mars is assessed.

Chaufray J.-Y. * Modolo R. Leblanc F. Chanteur G. Bertaux J.-L. Quemerais E. Retherford K. D.
Atmospheric Escape at Mars **[#9014]**
We describe the measurements of the atmospheric escape done by Mars Express and the estimation of the oxygen escape rates obtained from a 3D model of the martian exosphere coupled with a 3D model of the Mars-solar wind interaction.

Smith R. L. * Kostiuk T. Livengood T. A. Fast K. E. Hewagama T. Delgado J. D. Sonnabend G.
Ground Based Observation of Isotopic Oxygen in the Martian Atmosphere Using Infrared Heterodyne Spectroscopy **[#9120]**
Infrared spectra of isotopic CO_2 in the martian atmosphere were obtained using HIPWAC, which was interfaced at the NASA IRTF. Absorption features of the CO_2 isotopologues have been identified and the isotopic ratios of oxygen have been determined.

Kadish S. J. Head J. W. Forget F. Fastook J. L. Marchant D. R. **(1-minute poster summary)**
Decoding the Climate Signal in the Tharsis Montes Fan-shaped Deposits: The Dynamics of Tropical Mountain Glaciers **[#9030]**
Fan-shaped deposits extending NW from the Tharsis Montes on Mars are remnants of cold-based glaciers. We aim to use the morphologies within the FSDs in conjunction with atmospheric and glacial models to decode the climate signal left by the deposits.

12:30 – 2:00 p.m. LUNCH

Thursday, November 13, 2008
REFERENCE ATMOSPHERES, DATABASE AND ENTRY, DESCENT, LANDING ISSUES
2:00 – 3:30 p.m.

Chair: P. Withers

Engelund W. C. * Powell R. W. Tolson R. H. **(Invited, 20 minutes)**
Atmospheric Modeling Challenges and Measurement Requirements for Mars Entry, Descent and Landing **[#9025]**
The quest for improved knowledge of the martian atmosphere must be considered not only as a scientific endeavor, but also one of improving entry, descent, and landing engineering model capabilities, and ultimately system level robustness for Mars missions.

Millour E. * Forget F. González-Galindo F. Spiga A. Lebonnois S. Montabone L. Lewis S. R. Read P. L. López-Valverde M. A. Gilli G. Lefèvre F. Montmessin F. Desjean M.-C. Huot J.-P. MCD/GCM Development Team
The Latest (Version 4.3) Mars Climate Database **[#9029]**
The Mars Climate Database (MCD) is a freely distributed database of meteorological fields derived from General Circulation Model numerical simulations of the martian atmosphere, designed to be useful for many engineering and scientific studies.

Justh H. L. * Justus C. G.
Evaluating Mars Science Laboratory Landing Sites with the Mars Global Reference Atmospheric Model (Mars-GRAM 2005) **[#9096]**
Mars-GRAM is an engineering-level atmospheric model widely used for diverse mission applications. Results of Mars-GRAM analysis of MSL landing sites will be shown as an example of Mars-GRAM as a valuable planning tool for future Mars missions.

Hollingsworth J. L. *
Summary of the Mars Climate Modeling Center (MCMC) Workshop **[#9123]**
We present a brief summary of the Mars Climate Modeling Center (MCMC) workshop that was held at the NASA Ames Research Center, Space Science and Astrobiology Division, 30 September through 2 October 2008.

Cianciolo A. D. * Way D. W. Powell R. W. Chen A.
Mesoscale Atmosphere Model Implementation into Mars Science Laboratory Performance Simulations **[#9039]**
The MSL guided entry faces challenges that require alternative methods for atmosphere modeling. A method for implementing mesoscale models into the MSL performance simulation is discussed as are the results and the EDL design implications.

Desai P. N. *
All Recent Mars Landers Have Landed Downrange — Are Mars Atmosphere Models Mis-predicting Density? **[#9103]**
All recent Mars landers have landed further downrange than predictions. Reconstruction of their entries revealed a lower density than a priori model predictions. Is there a systemic issue in Mars atmosphere models that predict a higher density?.

Ferri F. Lewis S. R. Ball A. J. Colombatti G. Aboudan A. Angrilli F. Müller-Wodarg I. Hathi B. Leese M. R. Zarnecki J. C. EDLS Science Team **(1-minute poster summary)**
ExoMars Entry and Descent Science **[#9010]**
The entry, descent and landing of ExoMars offer a rare opportunity to perform *in situ* investigation of the Martian environment over a wide altitude range. We present an initial assessment of the atmospheric science that can be performed.

De Angelis G. Badavi F. F. Blattnig S. R. Clowdsley M. S. Qualls G. D. Singleterry R. C. Jr. Wilson J. W. **(1-minute poster summary)**

Updated Time-Dependent Models for the Mars Radiation Environment **[#9011]**

Models for the radiation environment to be found on the planet Mars have been developed. Primary particles rescaled for Mars conditions are transported through the Martian atmosphere, with temporal properties modeled with variable timescales, down to the surface.

Marzo G. A. Lopez-Valverde M. A. Gonzales-Galindo F. **(1-minute poster summary)**

Cluster Analysis of Martian Atmospheric Temperature Profiles **[#9081]**

We apply the cluster analysis to pressure-temperature profiles of the MCD with the double goal of building a simplified climatology for Mars, and evaluating trends and potential biases in the current MCD, specially at mesospheric and thermospheric altitudes.

3:30 – 4:00 p.m. **BREAK**

Thursday, November 13, 2008
FUTURE OBSERVATIONS
4:00 – 6:00 p.m.

Chair: J. Levine

Mẽyer M. * **(Invited, 20 minutes)**
NASA's Mars Exploration Program Over the Next Decade **[#9130]**
Over the past year, the community has developed possible Mars architectures that offer exciting science return and moves us closer to returning a sample from the red planet.

Gómez-Elvira J. * REMS Team **(Invited, 20 minutes)**
Environmental Monitoring Station for Mars Science Laboratory **[#9052]**
REMS is one of the instrument of the MSL payload, which has been designed for recording: pressure, humidity, wind speed and direction, ground and air temperature and ultraviolet radiation. A description of the instruments in included on the presentation.

Jakosky B. M. * MAVEN Science Team **(Invited, 20 minutes)**
The Mars Atmosphere and Volati,e Evolution (MAVEN) Mars Scout Mission **[#9036]**
The MAVEN mission was selected in September 2008 to proceed forward as the next Mars Scout mission. Details of the mission will be presented, and additional information can be found at our interim project web site, at http://lasp.colorado.edu/maven.

Drummond R. * Vandaele A. C. Neefs E. Mahieux A. Wilquet V. Montmessin F.
Detecting Trace Species on Mars with a SOIR Instrument **[#9044]**
The SOIR Instrument is currently in-orbit around Venus on the VEX satellite. We present the results of in-orbit calibration to demonstrate its capabilities. We will then show simulated Mars spectra as they would be seen by the SOIR instrument in orbit around Mars.

Smith M. D. * MSO Science Definition Team
Report of the Mars Science Orbiter (MSO) Science Definition Team **[#9067]**
NASA is considering launch of an orbiter called the Mars Science Orbiter (MSO) in 2016 or later. NASA formed a Science Definition Team (SDT) to define the scientific objectives and measurement requirements for such a mission. The report of the MSO SDT is described here.

Hipkin V. J. * Clancy R. T. Delory G. Fernandez-Remolar D. C. Garvin J. B. Levine J. S. Beaty D. W. HEM-SAG Team
Mars Human Reference Missions for Atmosphere and Climate: Report from HEM-SAG **[#9095]**
Climate/atmosphere reference mission activities for the initial phase of Mars human exploration, developed as a result of a study by the MEPAG Human Exploration of Mars Science Analysis Group (HEM-SAG), will be presented for discussion and input from the community.

Stam D. M. * Laan E. Snik F. Karalidi T. Keller C. ter Horst R. Navarro R. Aas C. de Vries J. Oomen G. Hoogeveen R.
Polarimetry of Mars with SPEX, an Innovative Spectropolarimeter **[#9078]**
We present SPEX, an innovative, compact, and robust spectropolarimeter that measures fluxes and polarization of sunlight reflected by Mars from 400 to 800 nm. With simulations we'll show how with SPEX atmospheric dust and the surface can be studied.

6:00 p.m. MEETING ADJOURNED